

Year 3 – Section C – Fractions

Australian Curriculum Statements:

ACMNA058	Model and represent unit fractions including $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{5}$ and their multiples to a complete whole
----------	--

Developmental Sequence for Fractions (p 2):

C1: Fractions are equal parts of a whole

C2: One half

C5: One quarter

JP7: Simple fractions

C3: Half of a group

C6: One quarter of a group

JP5: Ordering and comparing fractions

C4: Symbol for one half

C7: Symbol for one quarter

C8: Fraction names

Year 4 – Blast activity C4: Compare and order common fractions

JP = Journal Problem

Activities starting with a single letter, A – M, refer to a Blast activity

Blast Activities C1-C8:

Use the 'generic Blast lesson format' for the problems. The following information and prompts are provided for additional support.

Blast activity C1: *Fractions are equal parts of a whole*

Preparation:

Having a chocolate bar (or similar) to break into parts would be useful but is not necessary. All of your students should be able to participate in this activity including your support students. Be aware that this activity is likely to be completed very quickly by extension students.

Teaching Tips:

Lots of students have difficulty understanding that 'half' is not simply one whole broken into two pieces. The pieces must be the same for them to be halves. You cannot have a 'big half' and a 'small half'.

Support students: follow up this activity by finding halves of:

- Lines (string, tape measures, chalk lines on pavement)
- Areas (boxes, circles, 2D shapes)

Volumes (lumps of play dough, glasses of water)

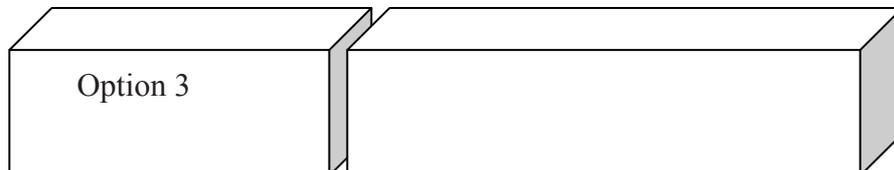
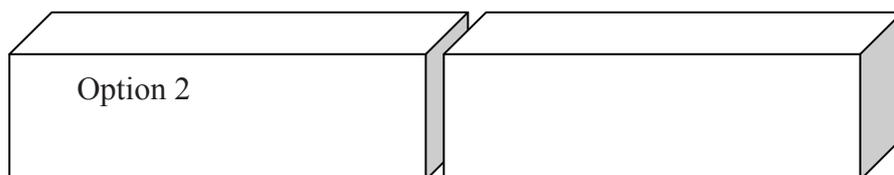
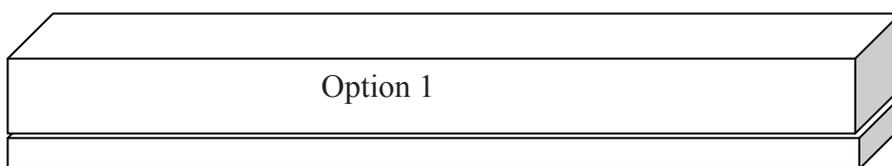
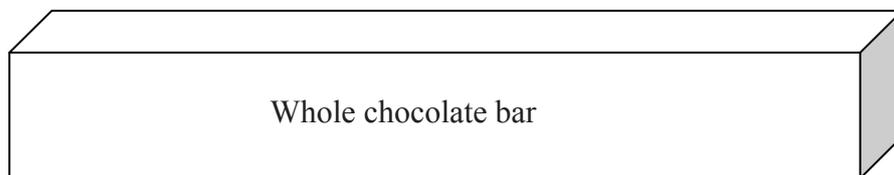
Follow up and application:

My mum gave me a sandwich for lunch (teacher: draw a picture). I wanted to eat half of it for morning tea and the rest for lunch. Draw how much I can eat at each break.

C1. Fractions are equal parts of a whole

 Fractions are used when dividing one whole up into parts. Today you will learn how these are used and some important things about them.

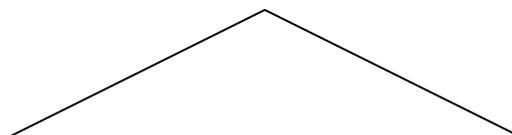
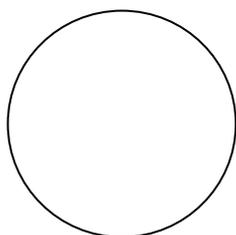
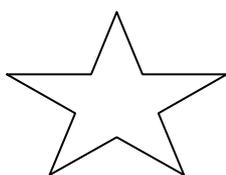
My sister and I wanted to share our chocolate bar so that we each had half. Look at the pictures below and decide which picture represents the fairest solution.



Which option represents the fairest solution? Explain why.

Fractions must always be 'fair'. What does this mean in terms of their size?

Draw halves on the following shapes. Make them fair.



Blast activity C2: *One half***Preparation:**

All of your students should be able to participate in this activity including your support students. Be aware that this activity is likely to be completed very quickly by extension students.

This is a deductive activity. We are showing students what 'half' is and isn't, and asking them to work out why some of the representations show half and the others don't.

Teaching Tips:

To introduce: Consider photocopying or redrawing the shapes on this page and giving them out to pairs of students. Each pair should decide whether their shape shows half or doesn't show half, and give a reason for their answer.

Write a sentence at the end that clearly explains the properties of 'half' of an object (e.g. 'Half' is shown when one whole is broken into two pieces that are the same).

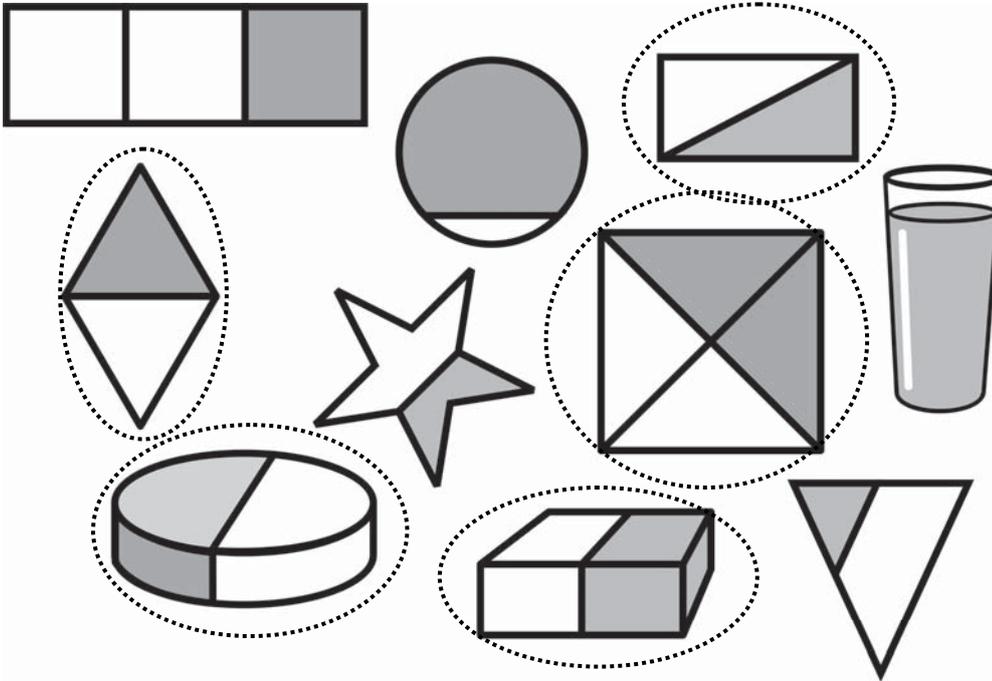
Follow up and application:

Cut out pictures of food from magazines and ask students to draw 'half' of the food pictured.

C2. One half

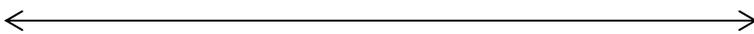
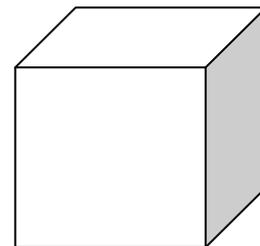
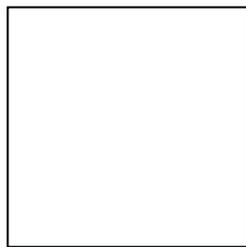
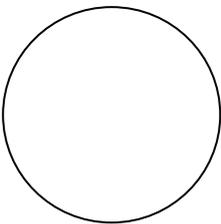
 Today you will learn about the fraction 'half'. You will learn why some pictures show one half and others don't, and what the symbol is for one half.

The shapes that are circled show half. The shapes that are not circled do not show half.



What is the difference between the shapes that show half and the shapes that do not show half?

Draw halves of the following:



Blast activity C5: *One quarter***Preparation:**

All of your students should be able to participate in this activity including your support students. Be aware that this activity is likely to be completed very quickly by extension students.

This is a deductive activity. We are showing students what 'one quarter' is and isn't, and asking them to work out why some of the representations show one quarter and the others don't.

Teaching Tips:

To introduce: Consider photocopying or redrawing the shapes on this page and giving them out to pairs of students. Each pair should decide whether their shape shows one quarter or doesn't show one quarter, and give a reason for their answer.

Write a sentence at the end that clearly explains the properties of 'one quarter' of an object (e.g. 'Quarters' are shown when one whole is broken into four pieces that are the same).

Support students: follow up this activity by finding quarters of:

- Lines (string, tape measures, chalk lines on pavement)
- Areas (boxes, circles, 2D shapes)

Volumes (lumps of play dough, glasses of water)

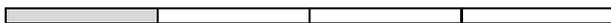
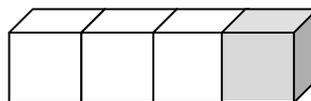
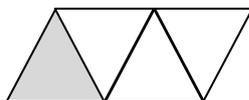
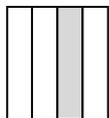
Follow up and application:

Cut out pictures of food from magazines and ask students to draw 'one quarter' of the food pictured (round or square objects such as cakes, donuts, sandwiches).

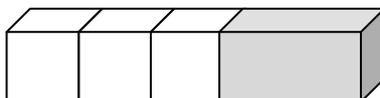
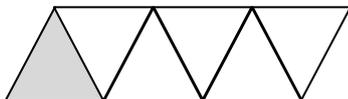
C5. One quarter

Today you will learn about the fraction 'one quarter'. You will learn why some pictures show one quarter and others don't, and what the symbol is for one quarter.

These shapes show one quarter:

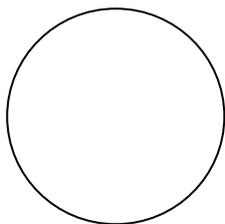


These shapes do not show one quarter:



What is the difference between the shapes that show one quarter and the shapes that do not show one quarter?

Draw quarters of the following shapes. Use a red pencil.



How did you know what to draw?

Journal problem 7: *Simple fractions*

Introduction:

Make sure that students have completed the initial work on fractions before progressing to this. The novel part in this activity is not learning what fractions are, but working out fractions of a group.

Mostly students in primary school classrooms tend to work with area models for fractions (a 2D shape broken into parts) instead of group models. These are very important to develop more solid understandings of fractions in later years.

This activity also introduces the symbolic form for fractions (e.g. $\frac{1}{2}$ for one half), so students need to make connections between the part and whole. Complete Blast activities C1, C2 and C5 before beginning this journal problem.

You will need: Labels available for students to draw on to represent the stickers.

Leading questions:

- How many of the students would have had the blue smile sticker?
- How can you show me what half of the students would look like?
- Here is a drawing of 12 stickers. Can you please draw onto these labels what the stickers looked like? How did you know what to draw?
- If there were only two students and half had the blue smile stickers how many would this be? How about if there were 4 students? 6 students? 8 students?

Misconceptions to watch out for:

- Students who make even groups for each colour (e.g. 4 have blue smiles, 4 have yellow smiles and 4 have pink stars) as they have not understood the relative size of the fractions.
- Students who think that $\frac{1}{2}$ means 2 students and $\frac{1}{4}$ means 4 students so give out 6 pink stars.

Teaching Tips:

- Support students: Use 12 students or 12 dolls to represent the students who got stickers. Have labels prepared with blue smiles, yellow smiles and pink stars. Have students attach the stickers to the right students, starting with 'half the students' who are meant to have blue smile stickers. If still stuck, change the question to 'Half had the blue smile stickers and the rest had pink stars'.
- Use the final prompt above only if students are really struggling.

Follow up ideas:

Give students another unit fraction to find out of a group (e.g. find $\frac{1}{2}$ of any even number). Have students work out how to write other unit fractions in symbolic format. Follow up with Blasts activities C3, C6 and C8.

PROBLEM 7: SIMPLE FRACTIONS

 TR p57

There are 12 people in Micala's class who are getting stickers from their teacher. Read through the information and work out how many kids got each sticker.

Information:

- Half of them choose the blue smile sticker.
- One quarter of them choose the yellow smile sticker.
- The rest choose the pink star sticker.



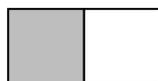
Draw the stickers and work out how many children chose the pink star sticker.

How many chose the pink star sticker?

 **Understanding:** How can you be sure?

Written form:

One half can be drawn as:



One half can be written as: $\frac{1}{2}$

What do you think the 1 means?

What do you think the 2 means?

Draw a picture of one quarter:



How could you write one quarter with numbers?
 (Hint: look at one half above)

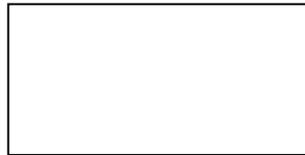
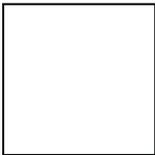
 **Sharing time:** How did you work out which numbers to use for one quarter?
How is your answer similar to the numbers for one half?

Linear model:

The line below shows **one whole**, draw another line underneath it to show **one half**.

Area model:

The shapes below show **one whole**, draw lines and shade them to show **one quarter**.



 **Understanding:** How do you know that you are right?

Manipulation problems:

Level 1: If the boxes above had two pieces shaded instead of one, what fraction would be shown? Draw it and write the fraction using numbers.

Level 2: Jenny said that half the class chose yellow smiles or pink stars. Is she right? Explain.

Teacher initials:

Date:

Problem solving / T&R:

- Problem solved with minimal or non-mathematical prompting
- Some leading questions were used to prompt thinking
- Solved after explanation
- Did not work out solution
- N/A- not a novel problem

Reasoning / Comm.:

(verbal, written, working and equations, or visual representations)

- Clearly and logically reasoned
- Easily understood
- Understood with some interpretation needed
- Some gaps but on topic
- Minimal or off topic

Understanding / Reflect:

- Connected manipulation problems to previous questions and answered easily
- Connected manipulation problems to previous questions with some prompting, and answered correctly
- Answered once the similarities to previous questions had been pointed out
- Had some problems in answers but was on the right track
- Did not answer appropriately
- Student not observed

Blast activity C3: *Half of a group***Preparation:**

Finding fractions of a group is very important for students. Be aware that working out fractions of a group instead of partitioning one whole can be difficult for support students.

Teaching Tips:

This is a deductive problem. It shows students what half of a group is and what half of a group isn't, and then asks them to work out what the difference between these is.

Watch for students who think that breaking a collection into two unequal groups is finding 'half'.

The groups must have the same amount in each.

Write a sentence at the end that clearly explains the properties of 'half' of a collection (e.g. 'Half' is shown when a collection is broken into two groups that are the same).

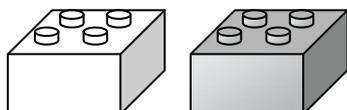
Follow up and application:

Drawing of a class of 24 students. "Half the class took the bus to school. Draw them on the bus seats" (make sure that there are more than 12 seats on the bus e.g. have 16 seats).

C3. Half of a group

 In this activity you will learn about fractions of a collection.

These collections show half:



Half of the Lego blocks are grey



Half of the shoes are boots

These collections do not show half:



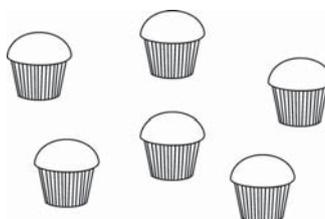
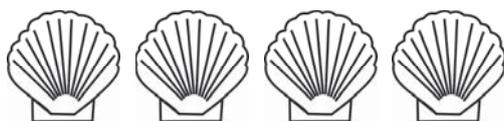
This is not half of the stars



This is not half of the clocks

What is the difference between the collections that show half and the collections that do not show half?

Colour half of these collections if you can. Put a cross through the ones that you can't.



BACKWARDS QUESTION:

Half of a collection of shells was three shells. Draw the whole collection.

Blast activity C6: *One quarter of a group***Preparation:**

Finding fractions of a group is very important for students. Be aware that working out fractions of a group instead of partitioning one whole can be difficult for support students.

Teaching Tips:

This is a deductive problem. It shows students what one quarter of a group is and what one quarter of a group isn't, and then asks them to work out what the difference between these is.

Watch for students who think that breaking a collection into four unequal groups is finding 'one quarter'. The groups must be the same.

Write a sentence at the end that clearly explains the properties of 'quarter' of a collection (e.g. 'Quarters' are shown when a collection is broken into four groups that are the same).

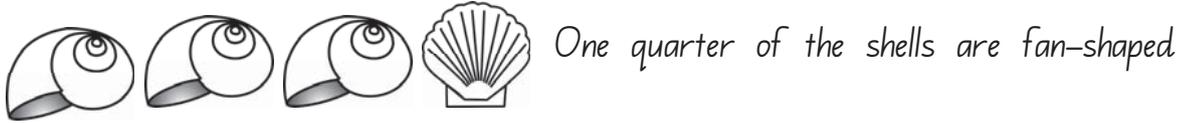
Follow up and application:

Drawing of a class of 24 students. "One quarter of the class took the bus to school. Draw them on the bus seats" (make sure that there are more than 6 seats on the bus e.g. have 10 seats).

C6. One quarter of a group

In this activity you will learn about fractions of a collection.

These collections show one quarter:

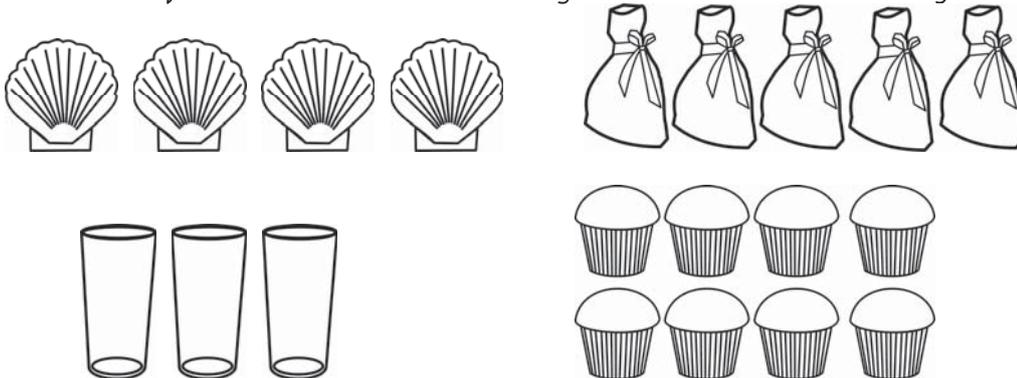


These collections do not show one quarter:



What is the difference between the collections that show one quarter and the collections that don't?

Colour one quarter of these collections if you can. Put a cross through the ones that you can't.



BACKWARDS QUESTION:

One quarter of a collection of shells was two shells. Draw the whole collection.

Section C: Fractions

Journal Problems: 5, 7

Use the 'generic Journal lesson format' for the Journal problems. The following information and prompts are provided for additional support.

Journal problem 5: *Ordering and comparing fractions*

Introduction:

Make sure that students have completed the initial work on fractions before progressing to this. Complete Journal problem 7 before Journal problem 5. The novel part in this activity is not learning what a half and quarter are, but comparing them to see how big they are. Complete Blast activities C1, C2 and C5 and Journal problem 7 before beginning this journal problem.

You will need: Have rulers and tape measures available for students.

Leading questions:

- Where do you think one half would go? How could you work it out? You are allowed to move your string.
- If I want to organise a tug-of-war using this string, where would the half-way point be?
- Let's take a look just at the half. Here's a piece of paper with 0 and 1 and halves marked on it. Can you show me $1/2$? How about $1/4$? How could you use this to work out where those fractions would fit on your line?
- Take the paper and demonstrate folding it in half to find the half way point. Ask students if they might be able to do something similar with their string to find the half way point.

Misconceptions to watch out for:

- Students who think anything broken into two pieces can be called halves (don't understand that fractions must be the same size). Give these students their own smaller piece of string (e.g. 1m long) and have them pretend that this is liquorice or candy and they have to give half to their friend. Where should they cut it?
- Students who try to put the quarter and half along the line at equal intervals (e.g. where $1/3$ would be and where $2/3$ would be instead of at $1/4$ and $1/2$).
- Students who find it hard to work out that $1/4$ is between 0 and $1/2$ and that $3/4$ is between $1/2$ and 1.

Teaching Tips:

- Support students: Watch out for Watch for Watch for Use prompt 3 above only if students are really struggling.

Follow up ideas:

Give students another unit fraction to place on the line (e.g. $1/5$, $1/3$). Watch to see them try to fold the string. Follow up with Blast activities C4, C7 and C8.

PROBLEM 5: ORDERING AND COMPARING FRACTIONS

Complete after problem 7

Stretch a piece of string across your classroom. Label one end of the string 0 and the other end 1. Mark on the string where one half would be and where one quarter would be.

Come up with a plan: How could you do it?

Draw your number line here:



 Sharing time: How did you work out where to put the fractions?

 Understanding: Why do you think one half is bigger than one quarter?

Manipulation problems:

Draw where you think one third would be.

The following pictures show a cake that has been cut in half in different ways. Circle the biggest half and be ready to explain why it is the biggest.



Teacher initials:

Date:

Problem solving / T&R:

- Problem solved with minimal or non-mathematical prompting
- Some leading questions were used to prompt thinking
- Solved after explanation
- Did not work out solution
- N/A- not a novel problem

Reasoning / Comm.:

(verbal, written, working and equations, or visual representations)

- Clearly and logically reasoned
- Easily understood
- Understood with some interpretation needed
- Some gaps but on topic
- Minimal or off topic

Understanding / Reflect:

- Connected manipulation problems to previous questions and answered easily
- Connected manipulation problems to previous questions with some prompting, and answered correctly
- Answered once the similarities to previous questions had been pointed out
- Had some problems in answers but was on the right track
- Did not answer appropriately
- Student not observed

Blast activity C4: *Symbol for one half***Preparation:**

This activity teaches students the symbolic representation for one half. **Do not complete if students do not have a solid understanding of physical representations of one half.**

Teaching Tips:

This is a deductive problem. It shows students a picture and symbol for one half and asks them to find the links between these. They need to work out that the two means that the whole is broken into two parts called halves (one HALF) and the one means you are talking about one of these parts (ONE half). The bottom number – denominator - tells you the name of the parts (halves, fifths, tenths etc.) and the top number – numerator - tells you how many of these parts you have.

Follow up and application:

This is a novel problem and can be used to assess Thinking and Reasoning to an 'A' or 'B' standard.

Blast activity C7: *Symbol for one quarter***Preparation:**

This activity teaches students the symbolic representation for one quarter. **Do not complete if students do not have a solid understanding of physical representations of one quarter.**

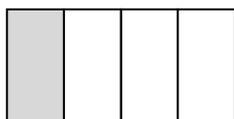
Teaching Tips:

This is a deductive problem. It shows students a picture and symbol for one quarter and asks them to find the links between these. They need to work out that the four means that the whole is broken into four parts called quarters (one QUARTER) and the one means you are talking about one of these parts (ONE quarter). The bottom number – denominator - tells you the name of the parts (halves, fifths, tenths etc.) and the top number – numerator - tells you how many of these parts you have.

C7. Symbol for one quarter

Today you will learn about the symbol for one quarter. It is shown below next to the picture of one quarter.

Use the picture below to work out what the one means and what the four means for the symbol of one quarter. Fill in the boxes.



$$\frac{1}{4}$$

The 1 means:

The 4 means:

How is the symbol for one quarter similar to the symbol for one half? Why do you think it is similar?

How is the symbol for one quarter different from the symbol for one half? Why do you think it is different?

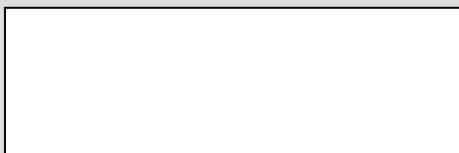
Use what you have learned to join up the following statements:

The top number says how many equal pieces there are altogether.

The bottom number says how many pieces are shaded or indicated.

BACKWARDS QUESTION:

One third is one piece shaded out of three equal pieces. Draw a picture of one third and write the symbol for it so that it would be like one half and one quarter. Explain what you did below.



Blast activity C8: *Fraction names***Preparation:**

This activity teaches students the names for fractions other than one half and one quarter. **Do not complete if students do not have a solid understanding of physical representations of one half and one quarter.** This activity also introduces fractions other than unit fractions (e.g. 2 fifths) in the Backwards Question.

Teaching Tips:

This is a deductive problem. It connects ordinal numbers to fractions with reference to a race. Students may have trouble with:

- Keeping the parts the same size (e.g. all thirds should be equal)
- Realising that one fifth is smaller than one half (e.g. thinking that because 5 is bigger than 2, then $\frac{1}{5}$ is bigger than $\frac{1}{2}$)

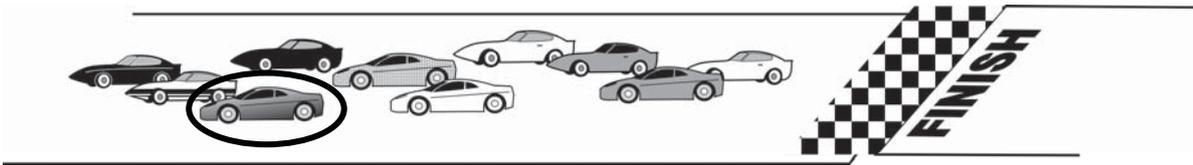
Follow up and application:

Dividing a cake into portions to suit a group of people coming to a party. The 'birthday girl' gets 2 slices instead of 1.

C8. Fraction names

Fractions are named similarly to ordinal numbers. Use this information to help you answer the questions below.

1. The cars below are having a race. Car number one came in first place. Car number two came in second place. What place did car number three come in?



This is the **same word** as that used for when one whole is broken into three equal parts. What would one of these parts be called?

Draw three equal parts onto the whole below. Write the name of each part on the picture.



2. What place would car number five come in?

This is the same word as that used for when one whole is broken into five equal parts. What would one of these parts be called?

Draw five equal parts onto the whole below. Write the name of each part on the picture

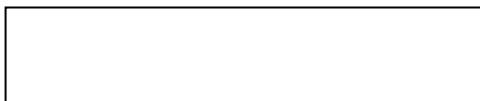
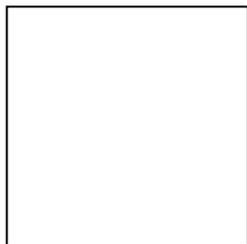
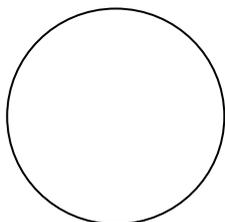


BACKWARDS QUESTION:

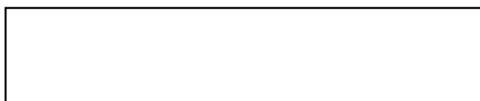
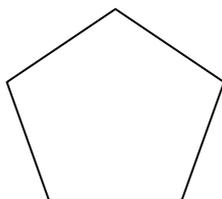
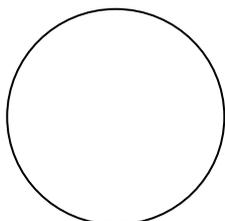
If a shape was broken into 7 pieces, what do you think each would be called? Explain why.

Further Questions: Draw the following fractions onto the shapes below.

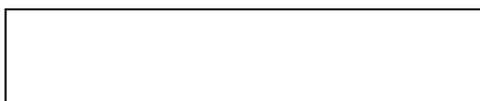
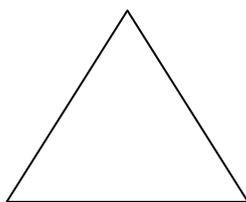
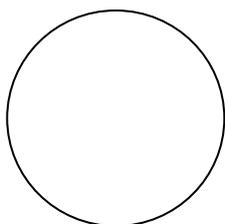
1. Draw halves:



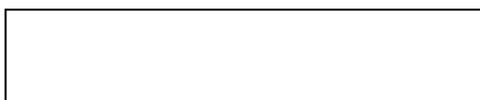
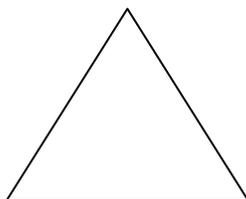
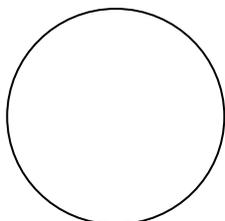
2. Draw fifths:



3. Draw thirds:



4. Draw fourths (also called quarters):



Why are the fifths smaller than the thirds?

BACKWARDS QUESTION:

Colour in two parts out of each shape. Guess what the name and symbol for each of your fractions is and write it in the space below.

Blast activity C4: *Compare and order common fractions***Preparation: Complete Journal problem 5 before beginning this activity.**

Have circles ready to be cut up for support students. Have protractors for Extension students, and be prepared to help them work out how many degrees there are in $\frac{1}{3}$ of a circle ($\frac{1}{3}$ of 360° or $360^\circ/3 = 120^\circ$). Be aware that this activity has two parts: making the fractions and ordering them.

Teaching Tips:

Use cut-up circles with support students. It is easy to fold halves, quarters and eighths but more tricky to do thirds, fifths and sixths. Consider cutting some circles to start with, labelling the parts appropriately, and having students solve 'jigsaw puzzles'. This way they can work out that three thirds = one whole, whereas five fifths are needed to make one whole.

Follow up and application:

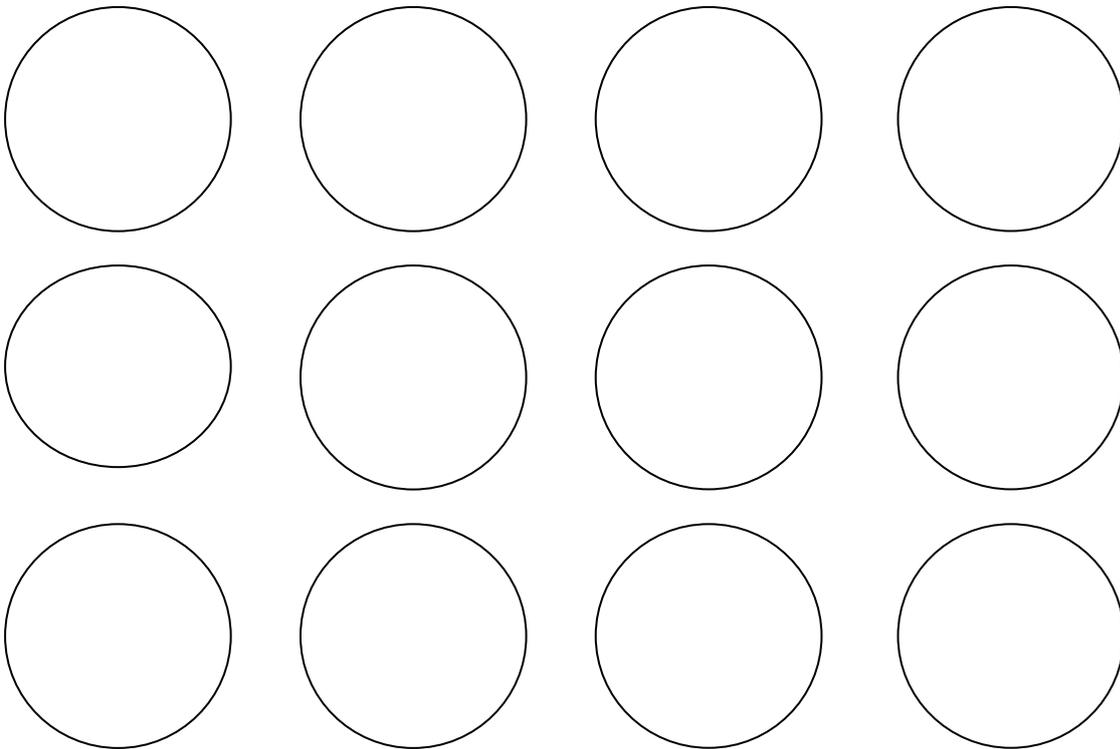
Students were given their marks on a test in fractions format. Which student got the most questions right? (choose fractions that students are struggling to understand)

C4. Compare and order common fractions

In this activity you will learn about the relative size of common fractions. You will compare them, and place them in order from smallest to largest.

Using the circles below, make the following fractions:

- One whole
- One half
- One third, two thirds
- One quarter, two quarters, three quarters
- One fifth, two fifths, three fifths, four fifths
- One tenth



Now rewrite the fractions from above in order from smallest to largest:

What did you find?

BACKWARDS QUESTION:

How many tenths could you use so that the fraction was the same size as one half? How many sixths? How many eighths? What do you notice?